Searching for arguments: applying a knowledge-based ontology of the legal domain

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ABSTRACT *Legal ontologies are conceptual models of specific parts of the legal domain. They provide stable foundations for domain representation, essential to building legal information systems. The ontology presented in this paper provides an analysis of the concept of knowledge in the legal domain. It is shown how new functions for IT applications in the legal domain can be developed on the basis of this analysis. In particular, a search function distinguishing between the content and structure of legal arguments is described in order to show how the analysis is put to practice.*

1 Introduction

The concept of knowledge takes an important place in the representation of the legal domain, because a large part of that domain consists of rules, norms, thoughts and skills that, ideally, can be qualified as knowledge. As such, the value of knowledge is unchallenged. However, what knowledge in the legal domain amounts to, remains obscure on many occasions. This article provides a brief overview of a conceptual model (an ontology) of the legal domain, based on the concept of knowledge. The research underlying this article is a follow-up to earlier work on legal ontologies (*cf.* Hage 1987, Van Kralingen 1995, Visser 1995, Oskamp 1998).

This article describes the potential contribution of legal theory to the analysis of the concept of knowledge in the legal domain. It does so in order to unveil the meaning of this concept, *e.g.*, in the phrase 'legal knowledge representation'. Often, knowledge representation refers to the representation of elements of the legal domain and relations between these elements, rather than to knowledge about these entities and relations. If knowledge is considered something 'in the head' of lawyers, an analysis of the difference between knowledge about a domain and the domain itself helps to prevent conceptual confusion. Thus, it is directly relevant to a well-founded legal ontology.

In this article, I explain the foundations of the knowledge-based ontology, and I explain how its constituents can be used for innovative ICT applications for use in the legal domain. First, I discuss the role and value of knowledge in a model of the legal domain, and the basic constituents of the model (section 2). Second, I demonstrate the practical relevance of the ontology by proposing a search function based on a distinction between structure and content of legal argumentation (section 3). Third, I provide a conclusion (section 4).

2 Constituents for a model of the legal domain

The knowledge-based ontology leaves open the possibility of expressing different views on the role of knowledge and the existence of entities in the legal domain. On a theoretical level, this enables us to avoid taking a stance in the legal-philosophical debate prior to building the model. In this sense, the model developed may be called a 'meta-ontology' of law – it allows for different views on what knowledge in the legal

domain actually amounts to. On a practical level, the model facilitates a detailed description of the context of knowledge items – how they are acquired, what they refer to, and how they are justified. To attain this, the model distinguishes between ontological status layers and epistemic roles. The ontological status layers enable the expression of different views on the existence of entities in the legal domain, and the epistemic roles enable expressing different views on what knowledge amounts to. In subsection 2.1, the value and utility of the knowledge concept are discussed. In subsection 2.2, the elements of the model are further explained. In subsection 2.3, I discuss epistemic roles in more detail.

2.1 The value and utility of knowledge

There are two basic grounds that support the assumption that the concept of knowledge as such is relevant. First, there is the utility of knowledge. Compared to mere belief, knowledge can be used as a reliable ground for decisions, behaviour and judgement. It may also serve as a means of gaining authority relative to those only having belief. In the legal domain, knowledge provides grounds for authoritative decisions. Rather than basing one's decision on relatively unreliable beliefs, the basis for one's inferences should be knowledge. Second, attaining knowledge is a goal that is worth aiming at as such, regardless of its utility. An argument with this content is put forward by Finnis (1980, p. 59-80). He claims that the pursuit of knowledge is a value, in the sense of a good: a goal that is worthwhile independent of any further utility in the achievement of survival, power, and popularity. The value of attaining knowledge is a principle of practical reasonableness, Finnis claims. It provides us with a direction in which we can lay out lines of argumentation. It can be used to generate new principles, and to direct the application of rules. In his discussion of the value of knowledge, he emphasises the importance of truth. Having knowledge presupposes truth, whereas beliefs can be true or false. Knowledge and truth are very close relatives, if we may regard the following quotation as representative of Finnis' opinion on the matter (1980, p. 61):

> "In explaining, to oneself and others, what one is up to, one finds oneself able and ready to refer to finding out, knowledge, truth as sufficient explanations of the point of one's activity, project, or commitment."

Finnis regards the value of knowledge as a self-evident principle. He asserts that self-evidence of some principle has little or nothing to do with our feelings of certitude about that principle. Rather, he claims, the self-evidence of a principle shows itself in its employment as a criterion for the assessment of feelings. A principle such as the worthiness of knowledge can, on principle, not be proved. It can be adopted, though, on the assumption that its employment is fruitful, or rather, that, if it is not adopted, rational discourse becomes hard or impossible. In sum, knowledge is a better starting point for making inferences (the utility argument), and it is worthwhile in its own (the value argument).

Knowledge, I claim, may be regarded as the mark of a quality stamp. It is a mark of approval; it says that a belief or a skill conforms to a set of criteria, and that it deserves to be called 'knowledge' for that reason. The applicable set of criteria depends on the type of entity that we wish to qualify as knowledge, and the context in which we encounter that entity. For instance, if we wish to qualify a belief about the actual selling of fake spare parts for automobiles as knowledge, we may demand that this belief is true. However, if we wish to qualify a belief about the breach of

copyright in a particular case as knowledge, we may demand that this belief is justified rather than true, as the legal qualification of a fact is often a matter of providing a suitable argument. Representing knowledge thus requires us to make explicit the criteria by which the represented entities deserve their qualification as knowledge. These criteria may apply to the acquisition, object and justification of the entities. Thus, they do not only concern the content (object) of knowledge, but also the sources of knowledge (acquisition), and the reasons there are to believe its content (justification). Together, the criteria provide a framework for assessing whether to assign the quality mark. What is more, they provide valuable additional information on represented knowledge.

2.2 Basic categories of the knowledge-based model of the legal domain

In most existing models of law, there is no clear distinction between knowledge about the legal domain on the one hand, and the legal domain itself on the other hand, or there is focus on only one of the two elements. Knowledge about the legal domain may play two roles: as the object of a model of the legal domain (represented by the arrow between boxes 1 and 2 in Figure 1), and as a potential part of the legal domain (because of the mutual dependence between knowledge about the legal domain and the legal domain itself, represented by the arrow between boxes 2 and 3 in Figure 1).

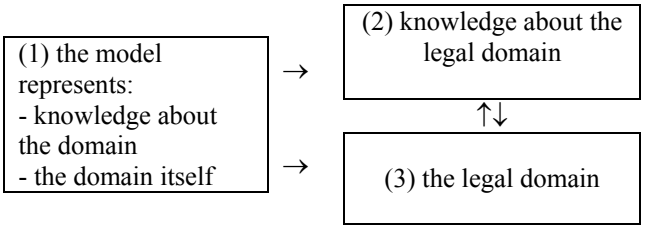

Figure 1. Distinction between model, knowledge and domain

An ontology specifies what elements and relations we can find in the legal domain. As a consequence of incorporating the concept of knowledge, the resulting ontology caters for the need to express relevant characteristics of knowledge about the legal domain. In Table 1, I give an overview of main types and subtypes present in the knowledge-based model of the legal domain. The basic types and subtypes represent categories of things and phenomena that are typical of the legal domain.

type	legally-relevant	legal
entities	sentences statements propositions beliefs artefacts rules concepts	legal rules legal principles legal norms legal decisions legal systematisations judicial interpretations judicial classifications legal concepts
ontological status layers	existence constitution recognition	legal efficacy legal validity legal recognition

type	legally-relevant	legal
epistemic roles	reasons defeaters factual knowledge practical knowledge	factual legal knowledge practical legal knowledge
relations	causation counting as recognition	legal causation legal counting as legal recognition
acts	applying rules making decisions making systematisations making interpretations making classifications	applying legal rules making legal decisions making legal systematisations making judicial interpretations making judicial classifications
facts	brute facts recognised facts conventional facts institutional facts	recognised legal facts conventional legal facts institutional legal facts

Table 1. An overview of the knowledge-based ontology of the legal domain

Although I will not go into all individual elements of the ontology, some words on its main types ought to clarify the model. Entities are basic objects that are encountered in the legal domain. They may be assigned certain characteristics in the form of ontological status layers and epistemological roles. Ontological status layers are the existence characteristics of legally-relevant and legal entities, acts, and facts. Epistemic roles are claims regarding objects, signifying their function in acquiring or justifying knowledge. Relations express interdependencies among phenomena. A relation may state the consequences of some event, or impose new roles on existing objects. Acts indicate the operations of individuals and institutions in the legal domain. Facts involve objects, the characteristics of those objects, characteristics of characteristics, and relations between objects and between characteristics. They express the attributes of entities, individuals and institutions, or the relations between them. The core of the ontology is found in the ontological status layers and epistemic roles, as they represent the characteristics regarding the existence and knowledge status of entities.

2.3 Epistemic roles

As explained before, ontological status layers and epistemic roles form the core of the ontology described in this paper. As the ontology aims to accommodate different views on existence and knowledge in the legal domain, it has to provide for the means to represent these views. In this subsection, I discuss epistemic roles, as they play a major role in the practical application proposed in section 3. Epistemic roles are claims regarding objects. They have two functions. Either they signify the function an object has in granting the knowledge predicate to a different object, or they signify the knowledge predicate itself. The former function is fulfilled by the epistemic roles reason and defeater, the latter by the roles factual knowledge and practical knowledge. If an object (e.g., a belief) has reason as its epistemic role, it supports the content of a statement, i.e., the object functions as a means to make us believe the statement. Therefore, it helps to turn the statement into knowledge by contributing to its justification. Thus, the epistemic role of one item may help to establish a different epistemic role for another item. The following epistemic roles are distinguished:

Reasons – Reasons are statements, propositions or facts that are employed for the explanation or justification of some other statement, proposition or fact (*cf.* Hage 1997). Each reason has a content (its meaning relative to its subject and object), a subject (a person, a group of persons or an authority, or there is no subject at all), an object (a belief, an action, a decision, a classification, an interpretation, or another reason), and a specific relation between subject and content (believe, constitute), and between content and object (explanatory, guiding).

Defeaters – Defeaters are negative reasons, *i.e.*, they attack some belief or reason in such a way that it is no longer correct. Defeaters that directly attack the conclusions of an argument are called 'rebutting defeaters'. Defeaters that attack the relation between a reason and its conclusion are called 'undercutting defeaters'. With an undercutting defeater, the assumption is challenged that some statement or fact is indeed a reason for a conclusion (Pollock 1999, p. 196). Just as reasons, defeaters can be classified according to the distinctions made above. A defeater has a content, a subject, an object, and there is a specific relation between subject and content, and between content and object. The specification of a defeater in terms of these characteristics is thus comparable to the specification of a reason.

Factual knowledge – The epistemic role 'factual knowledge' is granted to an entity if that entity complies with certain so-called knowledge criteria. Suitable entities are beliefs, statements and propositions. Knowledge criteria regard the acquisition, object and justification of knowledge. Reliability of acquisition, the truth relation between knowledge and its object, the coherence of a system of beliefs, and the justification of the content of knowledge together support the granting of the knowledge predicate. Factual knowledge concerns those parts of knowledge whose content can be expressed in a natural language. For a discussion of knowledge criteria, *cf.* Mommers and Van den Herik 2000, and Mommers 2002.

Practical knowledge – The epistemic role 'practical knowledge' is granted to those entities that comply with certain demands. Unlike factual knowledge, practical knowledge does not apply to well-described entities. Instead, it applies to certain skills and competences, for instance to the assessment capabilities of a judge, or the pleading skills of a lawyer. Criteria for the assessment of such knowledge are somewhat harder to determine, as the acquisition, object and justification dimensions are unclear. Rather than an existing object, against which knowledge can be tested, practical knowledge often produces new objects. The acquisition dimension thus becomes a production dimension, which can still rely on the reliability criterion. This applies especially to the legal domain, in which the ability to defend or assess a case, or to make a judgement, heavily depends on the experience of a legal professional.

3 Searching for arguments

A considerable part of the work of lawyers consists of finding arguments in favour of or against certain positions. Currently, search capabilities in most search engines are limited to using keywords or directly searching for a particular document by its name or number. Adding information on the content of documents enables searching for particular types of argument within a document, or visualising the argumentation structure. The argumentation structure of a document can be embedded in tags containing both a reference to the epistemic role of a text element, and to other relevant entities. For instance, if there is a text element that functions as a reason for the verdict of a judge, the tag grants the 'reason' role to that text element, and refers to the verdict in order to explain what the object of the reason is. Such structures may

be recursive, in that the object of a reason can be a reason for a different object. The structures can be visualised by the use of arrows and colours. Complex case law is thus made more accessible to lawyers and laymen. The epistemic roles help to establish the degree of justification of, for instance, a conclusion. The issue of justification in the legal domain has been subject of extensive research (*cf.*, *e.g.*, Gordon 1995, Verheij 1996, Hage 1997, and Prakken 1997).

The ontology described above offers a link between legal theory and legal practice. It does so by describing how basic roles relating to knowledge are accommodated in a conceptual model of the legal domain. Thereby, it helps contextualising knowledge – to provide relevant background information on the content of legal information systems. The different types of information on the nature of knowledge and the status of objects thus help to fulfil the information needs of individual users. The ontology sketched can be used to provide the basis for a meta-language describing the content and valuation of different elements of legal documents. The knowledge criteria mentioned in subsection 2.3 function as guidelines for drafting such a language. Truth can be employed as a criterion, but it requires an evaluative judgement of a text element, whereas truth does not lend itself to such subjective evaluations. The legal domain constitutes an intersubjective context, and therefore, criteria that can be valuated by a group of persons prevail: reliability, coherence and justification. Reliability is a useful criterion in a context in which people have to assess the general quality of a body of information and the suppliers of such information. Coherence is useful as a criterion for the assessment of internal consistency of legal documents, especially with respect to the line of argumentation found in the document. The criterion of justification can be used with respect to various elements of legal documents, such as reasons, defeaters, conclusions *etc.*

In order to explain how elements of the ontology can be applied to a search function based on both content and structure of legal arguments, first, I provide an example case that is used to explain the nature of the content and structure analysis proposed (subsection 3.1). Then, I outline the structural components (subsection 3.2) and content components (subsection 3.3) used for the search function (subsection 3.4). This section is concluded with some final remarks (subsection 3.5).

3.1 An example case

In order to explain the idea of a search function for use with documents tagged on the basis of both content and structural features, I provide an analysis of a small fragment of text. The following fragment is part of a judgement of the European Court of 5 October 1988 (case 53/87). It concerns a preliminary ruling on a question of a national court on the matter of manufacturing spare parts for cars. One of the two main questions dealt with in the ruling is whether a protective right on an ornamental design for a car may be exercised by the proprietor to prevent third parties from manufacturing and selling component parts. In the main proceedings, the plaintiffs would benefit from a negative answer to this question. The question is answered by the Court through the following line of argumentation:

> " "(1) Are Articles 30 to 36 of the EEC Treaty to be interpreted as prohibiting the proprietor of a protective right in an ornamental design which was granted in a Member State from asserting the corresponding exclusive right so as to prevent third parties from manufacturing and selling, and also exporting to another Member State, component parts which, taken as a whole, make up the bodywork of a car which has already been put on the market, that is to say component parts intended to be sold as spare parts for that car? [...]"
>
> 9 It is apparent from the order for reference that a number of independent manufacturers of spare parts for cars have invoked the rules on the free movement of goods with a view to persuading the national court not

to apply national industrial property legislation under which a car manufacturer may register a protective right in respect of an ornamental design for certain spare parts intended for cars manufactured by it. The independent producers thus sought to protect themselves from infringement proceedings intended to prevent them from manufacturing, for the purposes of sales on the internal market or for export, components covered by the exclusive right in question or to prevent them from importing from other Member States protected components manufactured there without the consent of the proprietor of the protected right in respect of the design.

10 It must first be stated that, as the Court held in its judgment of 14 September 1982 in Case 144/81 Keurkoop v Nancy Kean Gifts ((1982)) ECR 2853, with respect to the protection of designs and models, in the present state of Community law and in the absence of Community standardization or harmonization of laws the determination of the conditions and procedures under which such protection is granted is a matter for national rules. It is for the national legislature to determine which products qualify for protection, even if they form part of a unit already protected as such.

11 It should then be noted that the authority of a proprietor of a protective right in respect of an ornamental model to oppose the manufacture by third parties, for the purposes of sale on the internal market or export, of products incorporating the design or to prevent the import of such products manufactured without its consent in other Member States constitutes the substance of his exclusive right. To prevent the application of the national legislation in such circumstances would therefore be tantamount to challenging the very existence of that right.

12 It should also be borne in mind that pursuant to Article 36 restrictions on imports or exports justified on grounds of the protection of industrial and commercial property are permissible provided that they do not constitute a means of arbitrary discrimination or a disguised restriction on trade between the Member States. In that regard it need merely be stated, in the light of the documents before the Court, that the exclusive right granted by the national legislation to the proprietors of protective rights in respect of ornamental models for car bodywork components may be enforced, without distinction, both against those persons who manufacture spare parts within national territory and against those who import them from other Member States, and that such legislation is not intended to favour national products at the expense of products originating in other Member States.

13 Accordingly, it must be stated in reply to the first question that the rules on the free movement of goods do not preclude the application of national legislation under which a car manufacturer who holds protective rights in an ornamental design in respect of spare parts intended for cars of its manufacture is entitled to prohibit third parties from manufacturing parts covered by those rights for the purpose of sale on the domestic market or for exportation or to prevent the importation from other Member States of parts covered by those rights which have been manufactured there without his consent."

Summarising, the line of argumentation amounts to the following. According to the plaintiffs, an appeal to free movement of goods may prevent the occurrence of infringement of industrial property legislation in the third-party manufacturing and distribution of spare parts. There is no Community standardization or harmonization in establishing protection of designs and models, and therefore, national legislation on this matter applies. The essence of the protection of an ornamental model consists in the right to prevent its manufacturing and selling by third parties. Thus, preventing the application of national legislation on this matter means challenging the existence of the protective right. Restrictions of imports and exports based on protection of industrial property are permissible if they do not constitute arbitrary discrimination. As protective rights in respect of ornamental models may be enforced both against persons manufacturing and against persons importing such spare parts from other Member States, such restrictions are not intended to favour national products. Therefore, rules on the free movement of goods do not preclude the application of national legislation regarding model rights in case of production of spare parts by third parties. Table 2 provides a reconstruction of the argument in terms of reasons and defeaters. The table lists the individual reasons and defeaters, and indicates to what object they apply.

element	content	object	thesaurus categories
1	there is a lack of Community standardization or harmonization in protection of designs and models	reason for 2	harmonisation of legislation, protection of design and model rights
2	national legislation on the protection of designs and models applies	reason for 9	hierarchy of legislation, protection of design and model rights
3	the essence of the protection of ornamental models consists in the right to prevent its manufacturing and selling	reason for 4	protection of design and model rights, prevention of manufacturing
4	preventing the application of national legislation on the protection of ornamental models means challenging the existence of the protective right	reason for 10	prevention of manufacturing, protection of design and model rights
5	protective rights in respect of ornamental models may be enforced against persons importing, manufacturing or selling such spare parts	reason for 6	protection of design and model rights, manufacturing of goods, import within internal market
6	protective rights in respect of ornamental models are not intended to favour national products	reason for 7	protection of design and model rights, competition
7	restrictions of imports and exports based on the protection of industrial property do not constitute arbitrary discrimination	reason for 8	import within internal market, protection of industrial property, economic discrimination
8	restrictions of imports and exports based on the protection of industrial property are permissible	reason for 9	import within internal market, protection of industrial property
9	rules on the free movement of goods do not preclude the application of national legislation regarding model rights in case of the manufacturing or import of spare parts by third parties	reason for 10	protection of design and model rights, application of national legislation
10	the production of spare parts by third parties infringes intellectual property law	conclusion	protection of design and model rights, infringement of intellectual property rights

Table 2. An overview of the line of argumentation

3.2 Outline of basic structural components

The basic structure elements and roles distinguished for the search function are reasons, defeaters, and conclusions (which may also be intermediate conclusions). By adding tags referring to these elements, the argumentation structure of a document can be encoded. Adding these tags has to be done manually, and involves a certain degree of interpretation. The tags can be read by a dedicated parser to provide different views of the document. For instance, blue arrows can show the relations between reasons and conclusions, and red arrows show the relations between defeaters and reasons or defeaters and conclusions. Additionally, someone may read the document with all reasons *pro* or *contra* the verdict marked in blue or red, so that he can easily review the different arguments. Such markings also show whether a document is well-organised or ill-structured. On the basis of the tags, the argumentation structure can be re-arranged.

The elementary meta-language is defined in table 3. An argument consists of at least one conclusion, and at least one reason or one defeater for that conclusion. The tag ‘argument’ defines the boundaries of an argument or subargument in a text. Between the opening and closing tags, we find the reasons, defeaters and the conclusion of the argument. The tag ‘content’ is found between the opening and closing tags of a reason, defeater or conclusion. It applies to the nearest element, and it defines the content categories (part of the thesaurus) that apply to that element. The tag ‘reason’ indicates that some element functions as a reason for a different element.

The tag ‘defeater’ indicates that some element functions as a defeater for a different element. The tag ‘conclusion’ indicates that some element is an (intermediate) conclusion. One element can be assigned more than one tag: for instance, an element 1 may be a reason for element 2, whereas it is a defeater for element 3. Also, it may function as an (intermediate) conclusion. Each opening tag is accompanied by a closing tag. These two tags enclose the textual content of an argument.

meta-language element	explanation
argument	defines the boundaries of a (sub)argument in a text; each reason, defeater and conclusion within its scope is part of the argument
content(thesaurus_term_1; thesaurus_term_2;thesaurus_term_*n*)	defines the content categories applicable to a certain element; at least one content category should be given as an argument
reason(element_1,element_2,content)	defines the reason relation: element 1 is a reason for element 2; the content argument provides a brief representation of the reason
defeater(element_1,element_2,content)	defines the defeater relation: element 1 is a defeater for element 2; the content argument provides a brief representation of the reason
conclusion(element,content)	defines an element as an (intermediate) conclusion; the content argument provides a brief representation of the reason

Table 3. An overview of the meta-language

The structural mark-up of a text can be enhanced by using other categories found in the knowledge-based ontology. For instance, the entities (rules, norms *etc.*) and the relations that are part of the model (causation, counting as, recognition, and their legal forms) can be used to provide further information on the relations between the elements of a text. These may provide further search opportunities and even be the basis for automated reasoning processes. Such applications fall outside the scope of this article. Research in legal ontologies comprising a major role for formalised bodies of knowledge (especially rules) includes the CLIME and E-POWER projects (*cf. e.g.* Winkels *et al.* 1999, Boer *et al.* 2003).

There are three complications with respect to case law that need to be considered in order to build and maintain such a system. First, case law may contain various opinions, from different instances of the case, or from different judges. These opinions should be carefully distinguished from each other, although they may be part of the main argumentation structure of the complete document. Tagging thus should take place in accordance with all different argumentation structures in the document. Second, it is not always clear whether a reason supports a conclusion. Unclear argumentation structures are easily revealed if one attempts to make such structures explicit. Therefore, tagging can be a laborious and difficult task. Third, the argumentation structures may be more complex than can be covered reasonably by the elements discerned above. If this is the case, the structure has to be extended to a degree sufficient for the representation of actual argumentation structures. Existing research on the matter provides numerous opportunities for such an extension (*cf.* Prakken 1996, Verheij 1996, Hage 1997).

3.3 Outline of basic content components

The representation given in the content column of table 2 is still close to the original text. In order to indicate the import of the individual reasons and defeaters, a thesaurus is used. The thesaurus categories indicated in column 4 of table 2 are part of a small example thesaurus with only broader-narrower term relations, listed below. A

narrower term relates to a broader term by relations such as ‘is a part of’, ‘is a’ or ‘is a form of’. For instance, ‘protection of copyright’ is a part of ‘protection of intellectual property rights’. If the thesaurus is used for content tagging of case law, it should be noted that choosing terms is very important for the search function to work properly. If an element claims that there is an *infringement* of, for instance, copyright, then the appropriate thesaurus term should be added, as the meaningfulness of reasons and defeaters for that element is only present if they are appropriately linked to that infringement. Therefore, if an element claims that there is *no* infringement of copyright, a corresponding thesaurus category should be used (not ‘infringement of copyright’).

- intellectual property rights
  - protection of intellectual property rights
    - protection of database rights
    - protection of copyright
      - protection of related rights
    - protection of industrial property rights
      - protection of design and model rights
      - protection of patent rights
  - infringement of intellectual property rights
    - infringement of database rights
    - infringement of copyright
      - infringement of related rights
    - infringement of industrial property rights
      - infringement of design and model rights
      - infringement of patent rights

- internal market
  - export within internal market
  - import within internal market
  - manufacturing within internal market

- legislation
  - harmonisation of legislation
  - hierarchy of legislation
  - application of legislation

- competition
  - fair competition
  - unfair competition
  - economic discrimination

3.4 Search functions

If we wish to offer functions that extend search capabilities to the content of multiple documents, we have to find a way to combine the structural and content features in one search function. This requires us not only to determine the structural features of a document (its argumentation structure and elements), but also to find a way to compare documents on the basis of their contents. The approach employed relates to several research lines in modelling the structure and content of legal domains: factor hierarchies in case-based reasoning research (*cf. e.g.* Aleven 1997, Roth 2003), the classification of content categories in Conrad and Dabney (2001) and argumentation frameworks (*cf. e.g.* Bench-Capon 2002). Factor hierarchies indicate how different factors, relevant to a legal issue at hand, are related to each other, and whether they support each other. The content categories listed in Conrad and Dabney (2001) constitute an attempt to induce general categories of the content of arguments from a set of case law. An argumentation framework can be used to represent the argumentative content of a body of case law (*cf.* Bench-Capon 2002). In all research mentioned, real-life case material is used for building or testing the abstract framework. The approach employed in this article has two main characteristics: (1) it attempts to incorporate both the structure and the content of legal argumentation, and (2) the structure and content of argumentation are handled separately.

In order to attain the inclusion of both structure and content in a framework for tagging the content of case law, two elements are used: a meta-language that defines the structural categories, and a thesaurus that contains a hierarchy of arguments that can be used, grouped by subject, and arranged by their specificity. The meta-language contains the basic entities and relations that are to model arguments: reasons, defeaters and conclusions, a relation that lets us express what an element is about, and a relation that enables us to say that a certain element is a reason or defeater for a

different element. Tagging of arguments contained in documents should proceed by using items from both the meta-language and the thesaurus. In this manner, the relations between arguments found in different documents can be established.

The information on structural features helps to find reasons with regard to a specific argument, whereas the content features enable us to find arguments that are similar with regard to their subject. There are several possibilities to find similarities among cases. First, the content categories for a given element may be used to select elements with an identical (sub)set of those categories. Second, along the lines of the hierarchy among elements, thesaurus categories can be found that are related to the first element by the relation of being a reason or defeater for the other element. For instance, in table 2, element 6 is a reason for element 7. We may therefore add 'import within internal market' and 'economic discrimination' to the set of relevant search terms. This can be repeated until the chain of reasons and defeaters stops. In case of the example, the chain ends with element number 10: the conclusion.

search function	method	example
search starting with an arbitrary search term	matching thesaurus terms are the basis for searching reasons, defeaters and conclusions with those thesaurus term as content topics	search for the term 'export'; search engine returns all thesaurus terms containing 'export'; in this case 'export within internal market', and uses this term as the starting point for the search
search starting with an element in a tagged document	matching on the basis of the corresponding thesaurus term as a content topic and its role in the line of argumentation	the tag of a specific part of an argument says that it is a reason and that its content regards protection of copyright; this term is used as the starting point for the search
search starting with a complete document	matching on the basis of the line of argumentation in the document: its conclusion counts as the main search item	the conclusion of a specific document is that there is a case of infringement of design and model rights; this term is used as the starting point for the search; for additional results, the content categories found in the complete line of argumentation can be used

Table 4. An overview of search functions

Table 4 provides an overview of the three ways in which a search action can start: with an arbitrary search term, with an element in tagged document, or with a complete document. In practice, the search functions can be used as follows. Assume that we are looking for arguments in favour of the occurrence of an infringement of copyright. As 'infringement of design and model rights' is a thesaurus term, we can use it directly as a search term. We find all elements that contain the content tag 'infringement of design and model rights' and that are thus somehow related to the subject. We can also extend the search to those reasons that are in favour of the element found. So, for instance, we find an element that says that a certain third-party produced hub caps that look very similar to the car manufacturer's hub caps. This element is qualified as a reason for the element whose content tag is 'infringement of design and model rights'. A different element, containing the statement that fair competition demands non-interference with third party car spare parts manufacturing, is qualified as a defeater for the element marked as 'infringement of design and model rights'. Thereby, it is only found if we search for arguments against the occurrence of infringement of design and model rights. Additionally, we can broaden our scope by shifting our search one level upwards in the thesaurus. Our search now comprises all narrower terms of 'infringement of industrial property rights'. Especially if we are interested in competition issues, the specific part of intellectual property law may not be relevant to finding arguments. By broadening our scope within the thesaurus, we

can find arguments with the content tags ‘protection of industrial property rights’ and ‘protection of patent rights’.

search option	method	example
narrower terms expansion	the search is extended with terms from the thesaurus that are narrower terms of the original search terms	search for the term ‘internal market’ includes the search for ‘export within internal market’, ‘import within internal market’ and ‘manufacturing within internal market’
broader term/sister term expansion	the search is extended with terms from the thesaurus that are broader terms and sister terms of the original search terms	search for the term ‘export within internal market’ includes the search for ‘internal market’
argument role expansion	the search can be either limited to similar argumentative roles, or supplemented with other argumentative roles	the search can be limited to only reasons for the conclusion that there is an infringement of copyright, or extended to reasons and defeaters for that conclusion
argument tree upward expansion	the search is extended with the content and structure tags found higher in the argument tree (towards the conclusion)	a search on the basis of element 6 in table 3 is expanded to the elements 7 through 10
argument tree downward expansion	the search is extended with the content and structure tags found lower in the argument tree (towards the basic reasons and defeaters)	a search on the basis of element 6 in table 3 is expanded to element 5

Table 5. An overview of search options

Table 5 lists the ways in which a search can be extended with content or structure categories. The extension can be attained through either the hierarchical lines of the thesaurus (narrower terms expansion, broader term/sister term expansion), through the lines of the argumentation structure (argument role expansion, argument tree upward expansion, argument tree downward expansion).

3.5 Final remarks

The concept for a search function described in this section relates to both research in argumentation theory and to case-based reasoning. It differs from these research lines, in that it detaches content from structure, and uses them separately for finding related arguments. What is the advantage of this detachment? First, it helps to make an analogy between argumentation analysis and ‘regular’ natural-language processing. The latter discipline generally separates syntax and semantics, thereby conforming to the different nature of structure and content analyses of natural language. Separation of structure and content analyses may induce the possibility of automating part of these processes. The structural analysis may be supported by grammatical characteristics of arguments, and the content analysis may benefit from an extensive thesaurus that can be matched against fragments of texts.

There are several issues that should be addressed with respect to the concept described above, but that fall outside the scope of this article. First, there is the issue of how the actual selection and weighing of thesaurus terms should take place, if the pattern of reason and defeater relations is taken as a starting point for finding related content. For instance, starting with a search action for reasons with respect to a certain conclusion in a line of argumentation, the reasons that are relatively distant from the conclusion are presented with a lower ranking than reasons that are directly linked to that conclusion. Ranking can also be based on the matching between content items: for instance, if a reason and a conclusion are marked with the same thesaurus items, they will rank higher than if their content items do not overlap.

Second, we encounter the issue of how to annotate existing case law efficiently and effectively, considering the time-consuming task of argument analysis. A vast investment is needed to enrich case law with all the structure and content markings that are needed for the search function presented. Apart from that, there is a need to secure the relative neutrality and consistency of the markings. Therefore, a rule set is needed that guides annotators in their work. Automation of the process could be considered, as discussed above.

Third, there is the issue of how to measure precision and recall of the search function with a substantial body of annotated case law. A comparison with other methods of information retrieval should indicate if and to what extent the argumentative structure and content help to further the quality of search results. These three issues should be taken into consideration with respect to an experimental setup, in which the search function can be used with a body of case law, and the same body of case law is made available with other search methods.

4 Conclusion

In this article, I have explained the ideas underlying a knowledge-based ontology of the legal domain. The ontology enables us to (1) distinguish between knowledge and its object, (2) determine criteria to assess the quality of knowledge, and (3) distinguish ontological status layers and epistemic roles to accommodate different views on legal knowledge. On the basis of an overview of the model of the legal domain, I gave an example of its potential application in a search function. In this application, searching takes place along the lines of argumentation, in order to provide access to reasons and defeaters specific to a certain stance. By separating the structure and content of legal argumentation, it becomes possible to find specific reasons, defeaters and conclusions through their specific place in a line of argument, on the basis of their content, or through a combination of these.

Acknowledgements

Section 2 in this article is partly based on an Icail conference publication (Mommers 2003). The research described was originally funded by the Dutch Science Foundation under number 415-03-034. I would like to thank Aernout Schmidt and Annemarie Beunen for their comments on previous versions of this article.

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